FIG. 1

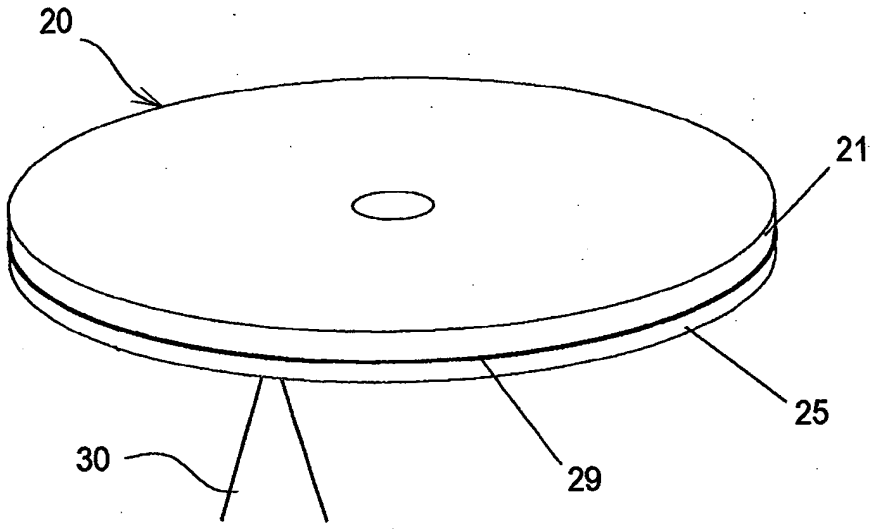


FIG.2

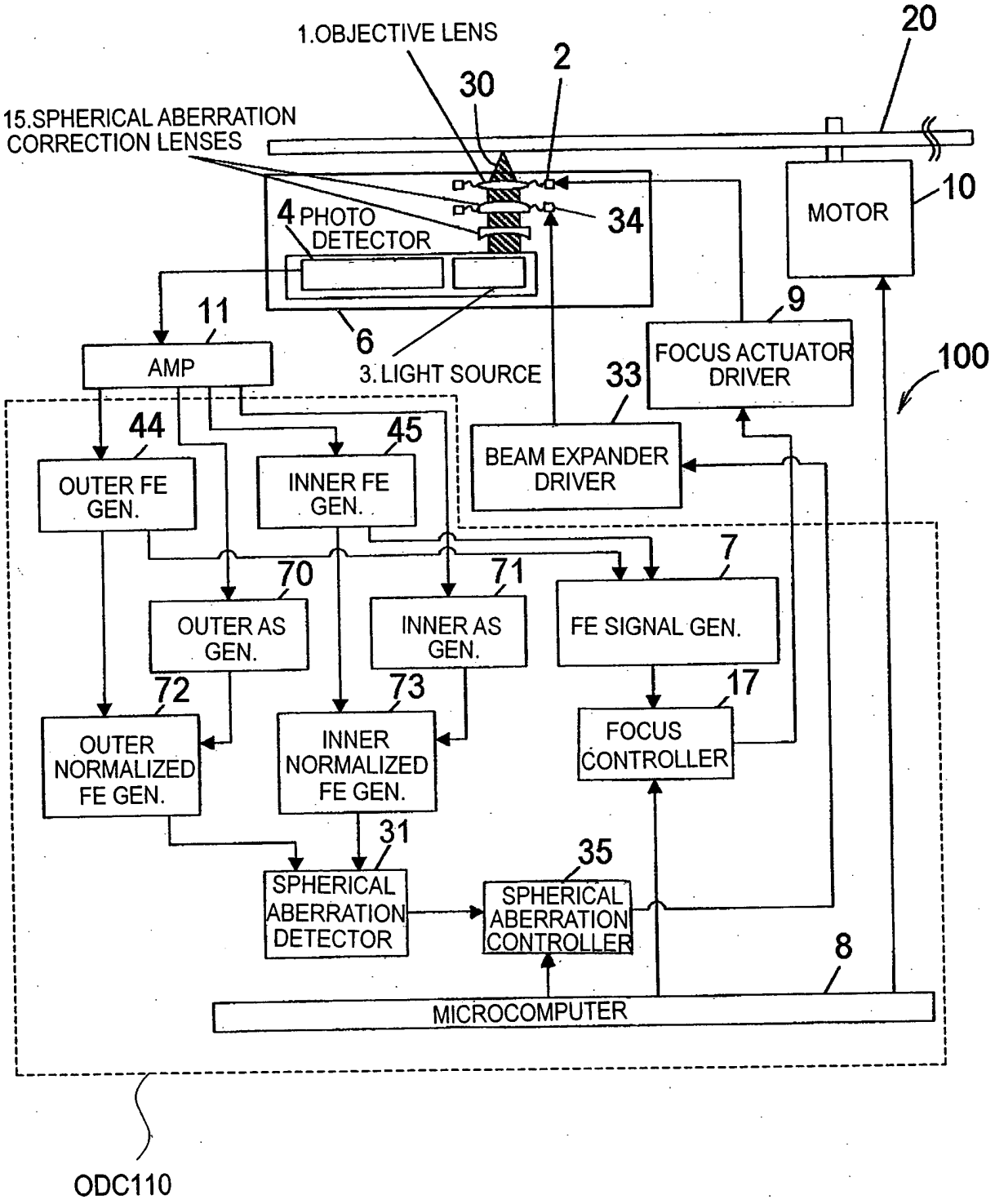

1.OBJECTIVE LENS
2
20
30
15.SPHERICAL ABERRATION CORRECTION LENSES
4 PHOTO DETECTOR
34
MOTOR
10
9
11
AMP
6
3. LIGHT SOURCE
33
FOCUS ACTUATOR DRIVER
100
44
45
OUTER FE GEN.
INNER FE GEN.
BEAM EXPANDER DRIVER
7
70
71
OUTER AS GEN.
INNER AS GEN.
FE SIGNAL GEN.
72
73
17
OUTER NORMALIZED FE GEN.
INNER NORMALIZED FE GEN.
FOCUS CONTROLLER
31
35
SPHERICAL ABERRATION DETECTOR
SPHERICAL ABERRATION CONTROLLER
8
MICROCOMPUTER
ODC110

FIG.3

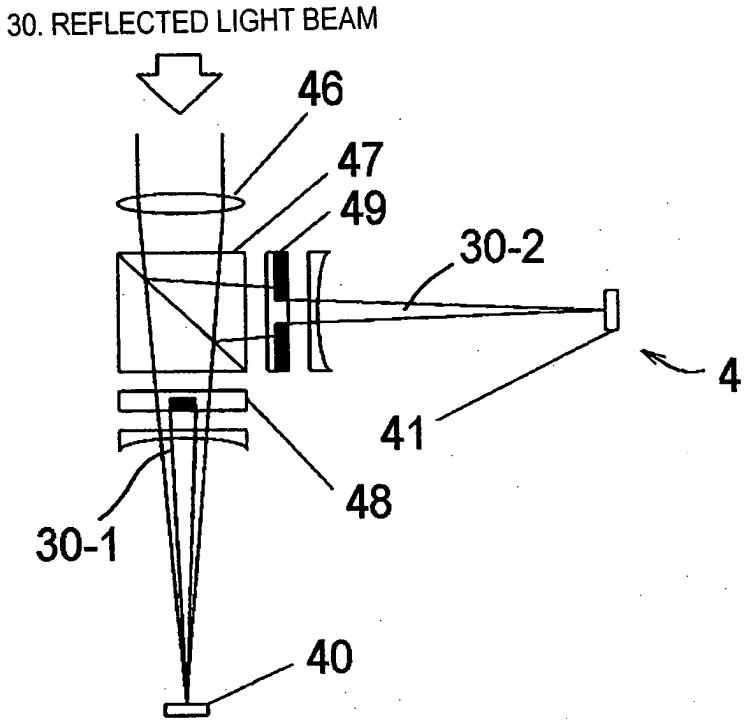


FIG. 4

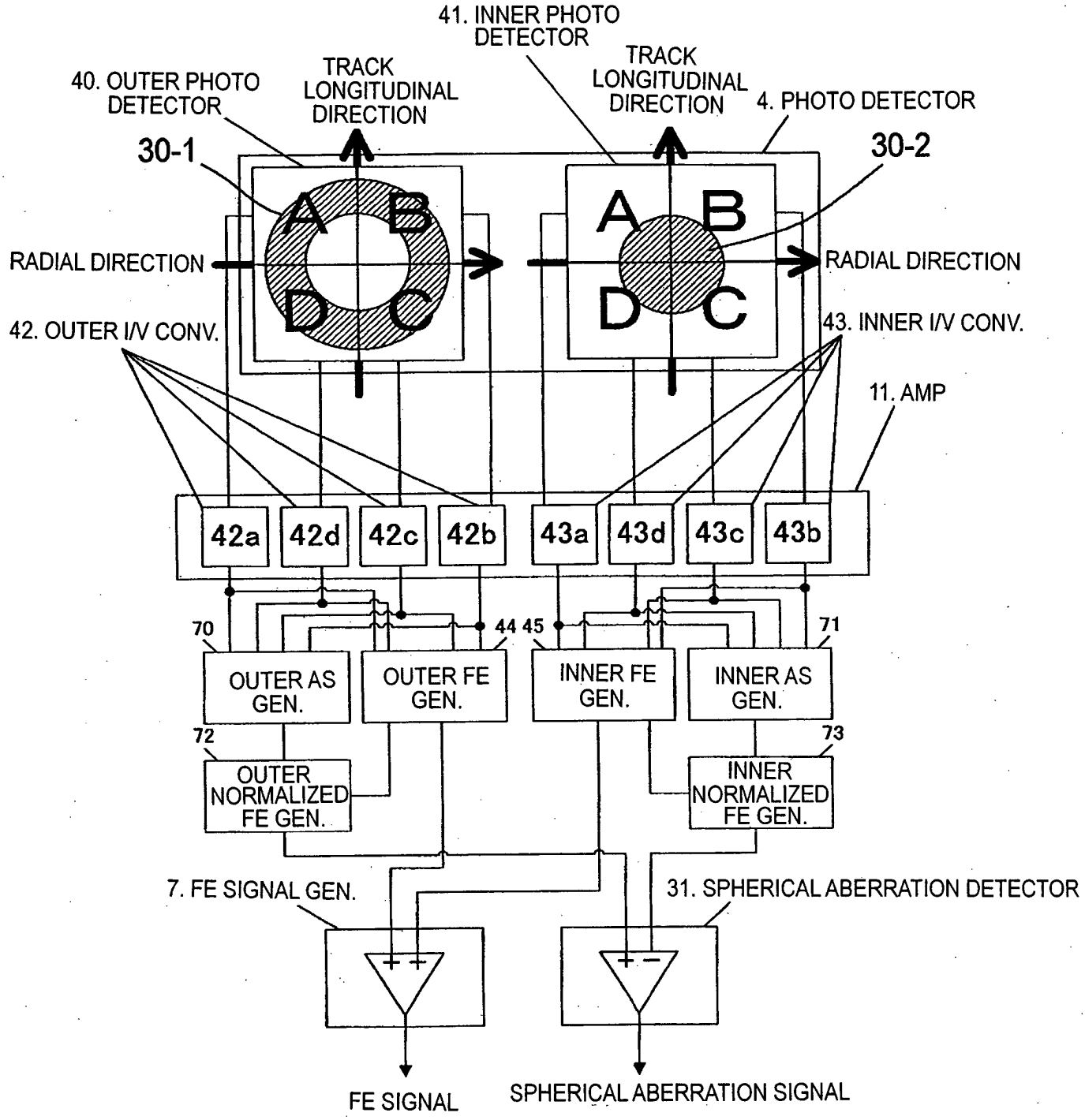

41. INNER PHOTO DETECTOR
TRACK LONGITUDINAL DIRECTION
TRACK LONGITUDINAL DIRECTION
40. OUTER PHOTO DETECTOR
4. PHOTO DETECTOR
30-1
30-2
A
B
D
C
A
B
D
C
RADIAL DIRECTION
RADIAL DIRECTION
42. OUTER I/V CONV.
43. INNER I/V CONV.
11. AMP
42a
42d
42c
42b
43a
43d
43c
43b
70
44
45
71
OUTER AS GEN.
OUTER FE GEN.
INNER FE GEN.
INNER AS GEN.
72
73
OUTER NORMALIZED FE GEN.
INNER NORMALIZED FE GEN.
7. FE SIGNAL GEN.
31. SPHERICAL ABERRATION DETECTOR
+ +
+ −
FE SIGNAL
SPHERICAL ABERRATION SIGNAL

FIG.5

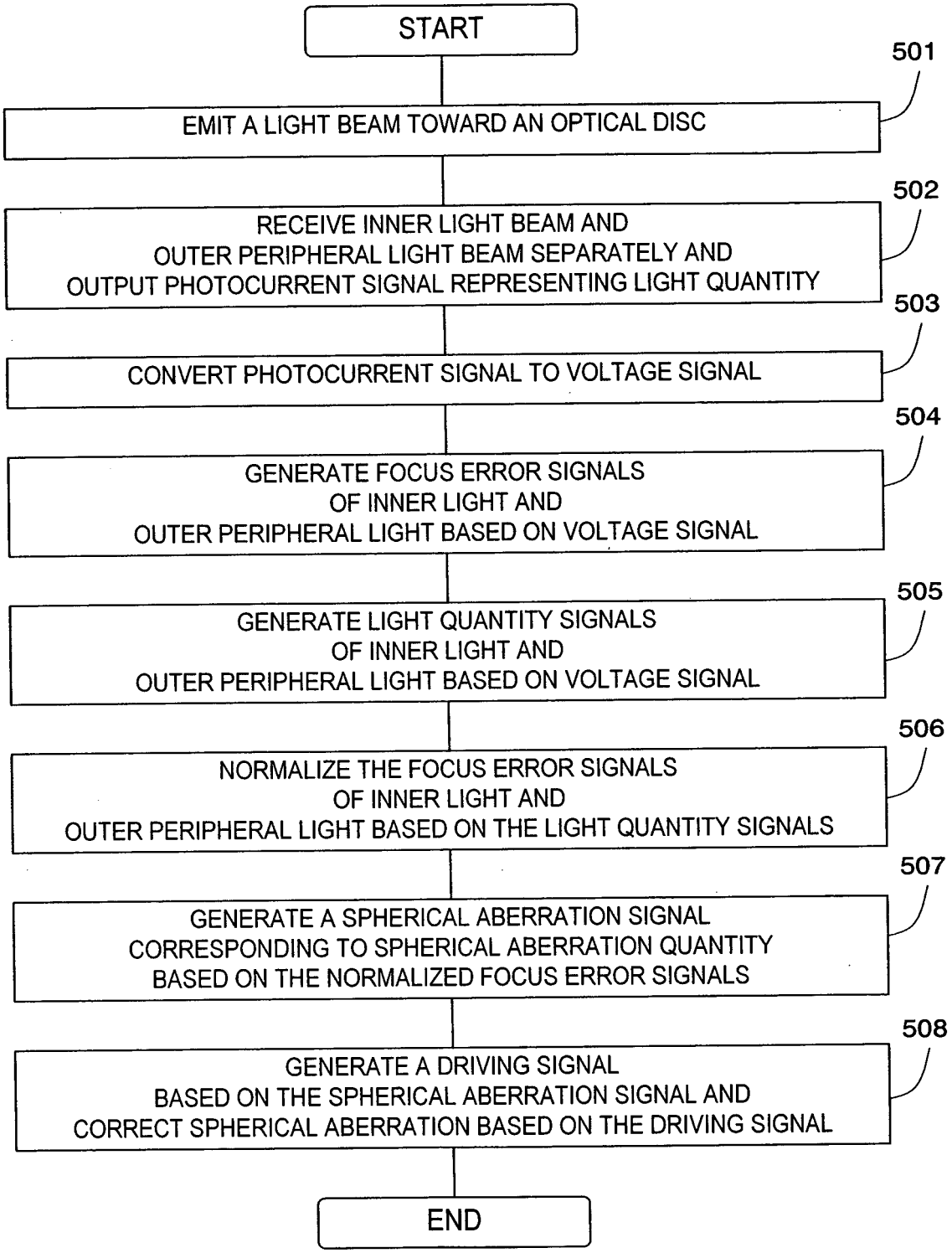

START
501
EMIT A LIGHT BEAM TOWARD AN OPTICAL DISC
502
RECEIVE INNER LIGHT BEAM AND
OUTER PERIPHERAL LIGHT BEAM SEPARATELY AND
OUTPUT PHOTOCURRENT SIGNAL REPRESENTING LIGHT QUANTITY
503
CONVERT PHOTOCURRENT SIGNAL TO VOLTAGE SIGNAL
504
GENERATE FOCUS ERROR SIGNALS
OF INNER LIGHT AND
OUTER PERIPHERAL LIGHT BASED ON VOLTAGE SIGNAL
505
GENERATE LIGHT QUANTITY SIGNALS
OF INNER LIGHT AND
OUTER PERIPHERAL LIGHT BASED ON VOLTAGE SIGNAL
506
NORMALIZE THE FOCUS ERROR SIGNALS
OF INNER LIGHT AND
OUTER PERIPHERAL LIGHT BASED ON THE LIGHT QUANTITY SIGNALS
507
GENERATE A SPHERICAL ABERRATION SIGNAL
CORRESPONDING TO SPHERICAL ABERRATION QUANTITY
BASED ON THE NORMALIZED FOCUS ERROR SIGNALS
508
GENERATE A DRIVING SIGNAL
BASED ON THE SPHERICAL ABERRATION SIGNAL AND
CORRECT SPHERICAL ABERRATION BASED ON THE DRIVING SIGNAL
END

FIG. 6A

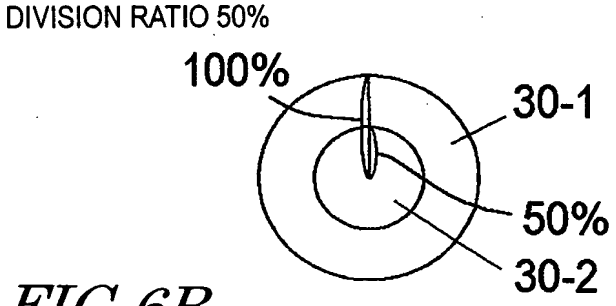


FIG. 6B

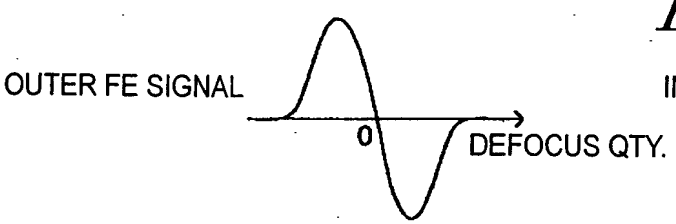


FIG. 6C

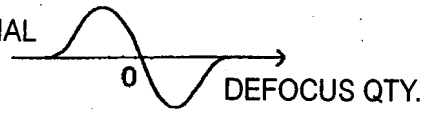


FIG. 6D

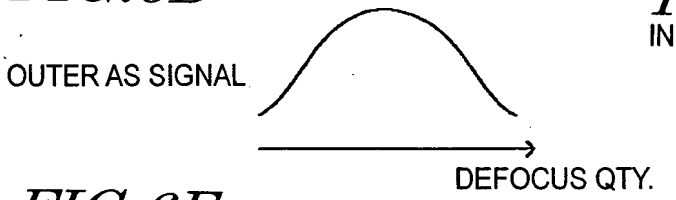


FIG. 6E

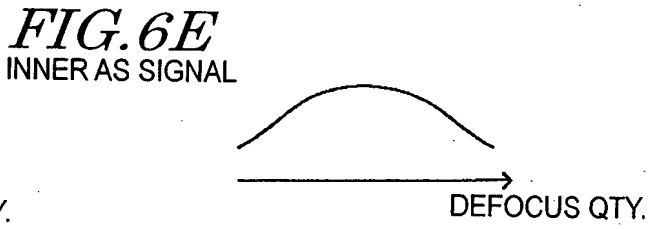


FIG. 6F

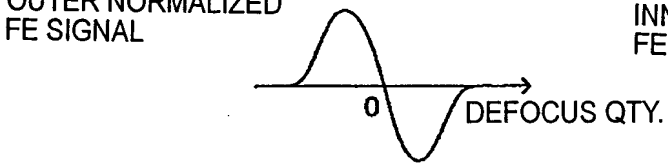


FIG. 6G

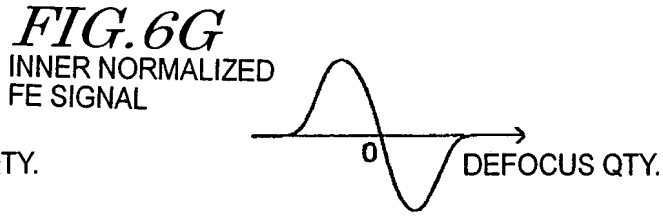


FIG. 6H

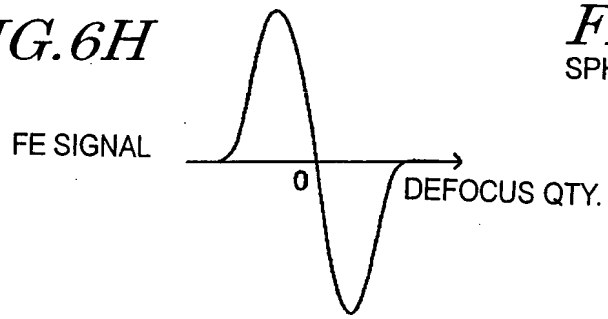


FIG. 6I

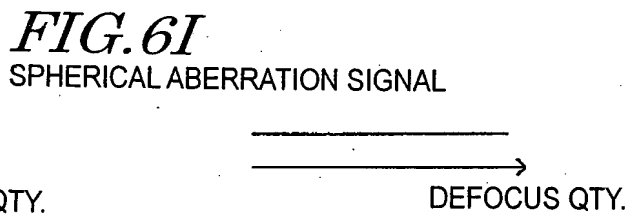


FIG. 7A
FE SIGNAL

FIG. 7B
CHANGE IN THICKNESS OF OPTICAL DISC ON IRRADIATING POSITION

FIG. 7C
SPHERICAL ABERRATION SIGNAL (PRIOR ART)

FIG. 7D
SPHERICAL ABERRATION SIGNAL (PRESENT INVENTION)

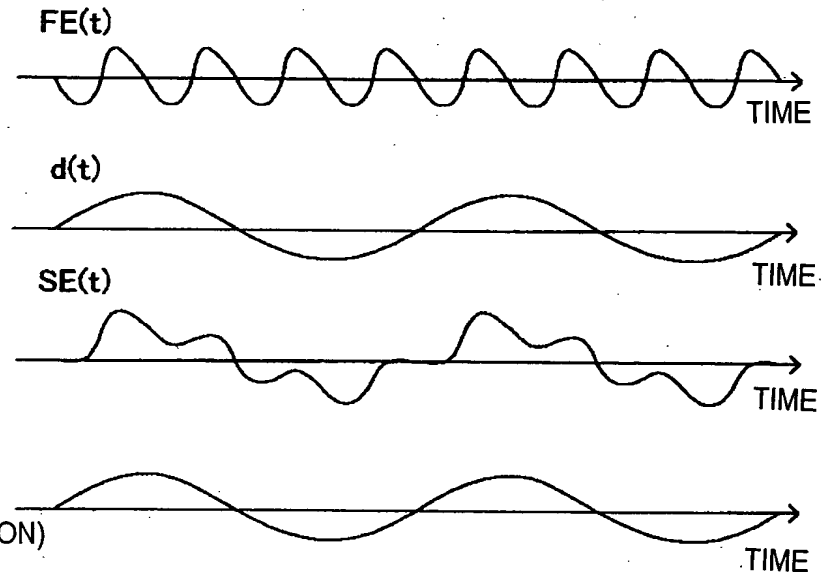


FIG.8

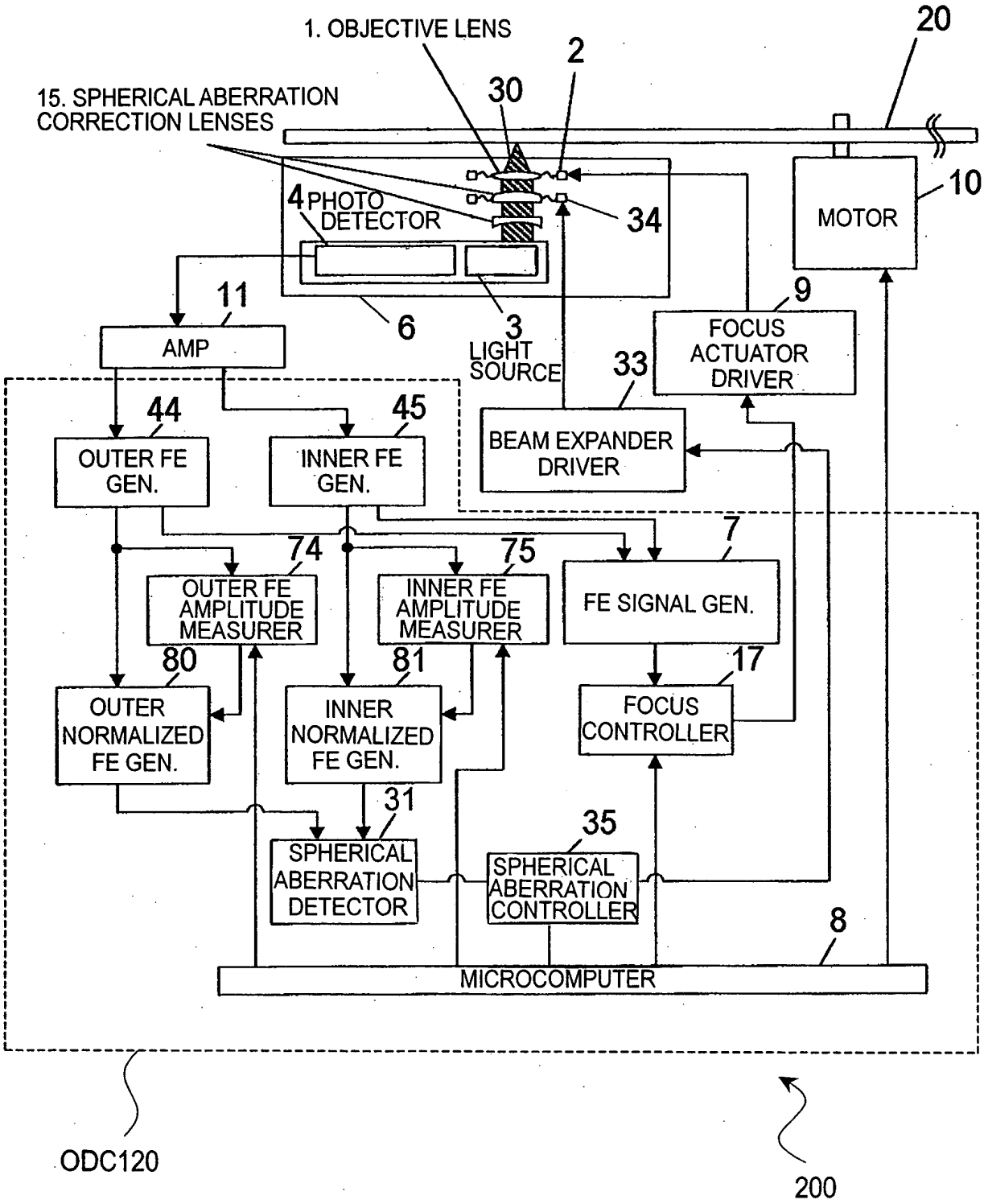

1. OBJECTIVE LENS
2
20
15. SPHERICAL ABERRATION CORRECTION LENSES
30
4 PHOTO DETECTOR
34
MOTOR
10
11
6
3
LIGHT SOURCE
9
AMP
FOCUS ACTUATOR DRIVER
33
44
45
OUTER FE GEN.
INNER FE GEN.
BEAM EXPANDER DRIVER
7
74
75
OUTER FE AMPLITUDE MEASURER
INNER FE AMPLITUDE MEASURER
FE SIGNAL GEN.
80
81
17
OUTER NORMALIZED FE GEN.
INNER NORMALIZED FE GEN.
FOCUS CONTROLLER
31
35
SPHERICAL ABERRATION DETECTOR
SPHERICAL ABERRATION CONTROLLER
8
MICROCOMPUTER
ODC120
200

FIG.9A

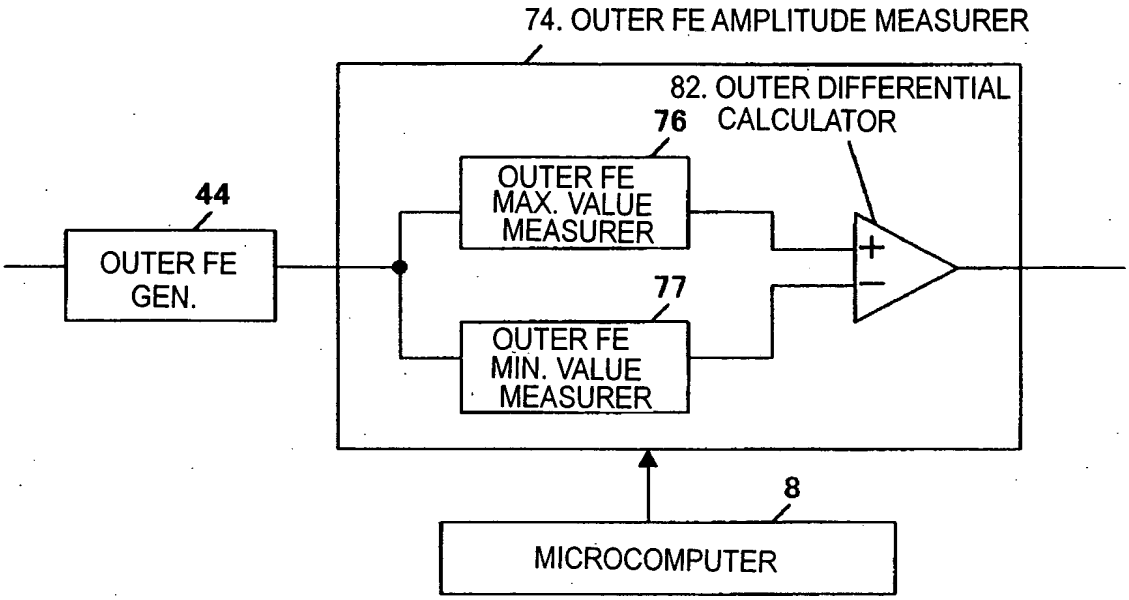

74. OUTER FE AMPLITUDE MEASURER
82. OUTER DIFFERENTIAL CALCULATOR
76
OUTER FE MAX. VALUE MEASURER
44
OUTER FE GEN.
77
OUTER FE MIN. VALUE MEASURER
+
−
8
MICROCOMPUTER

FIG.9B

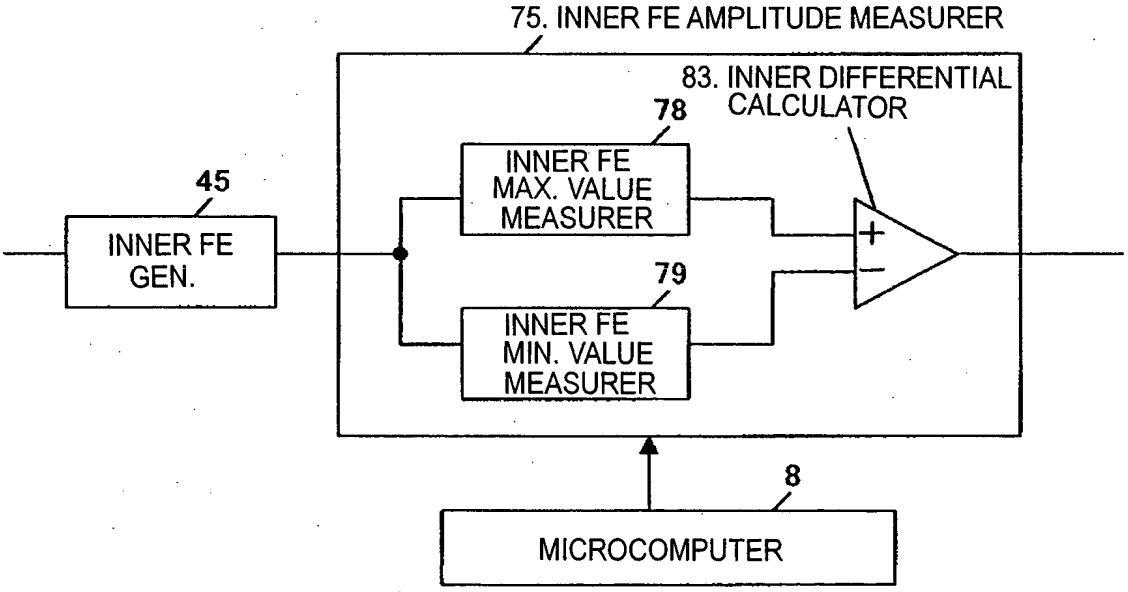
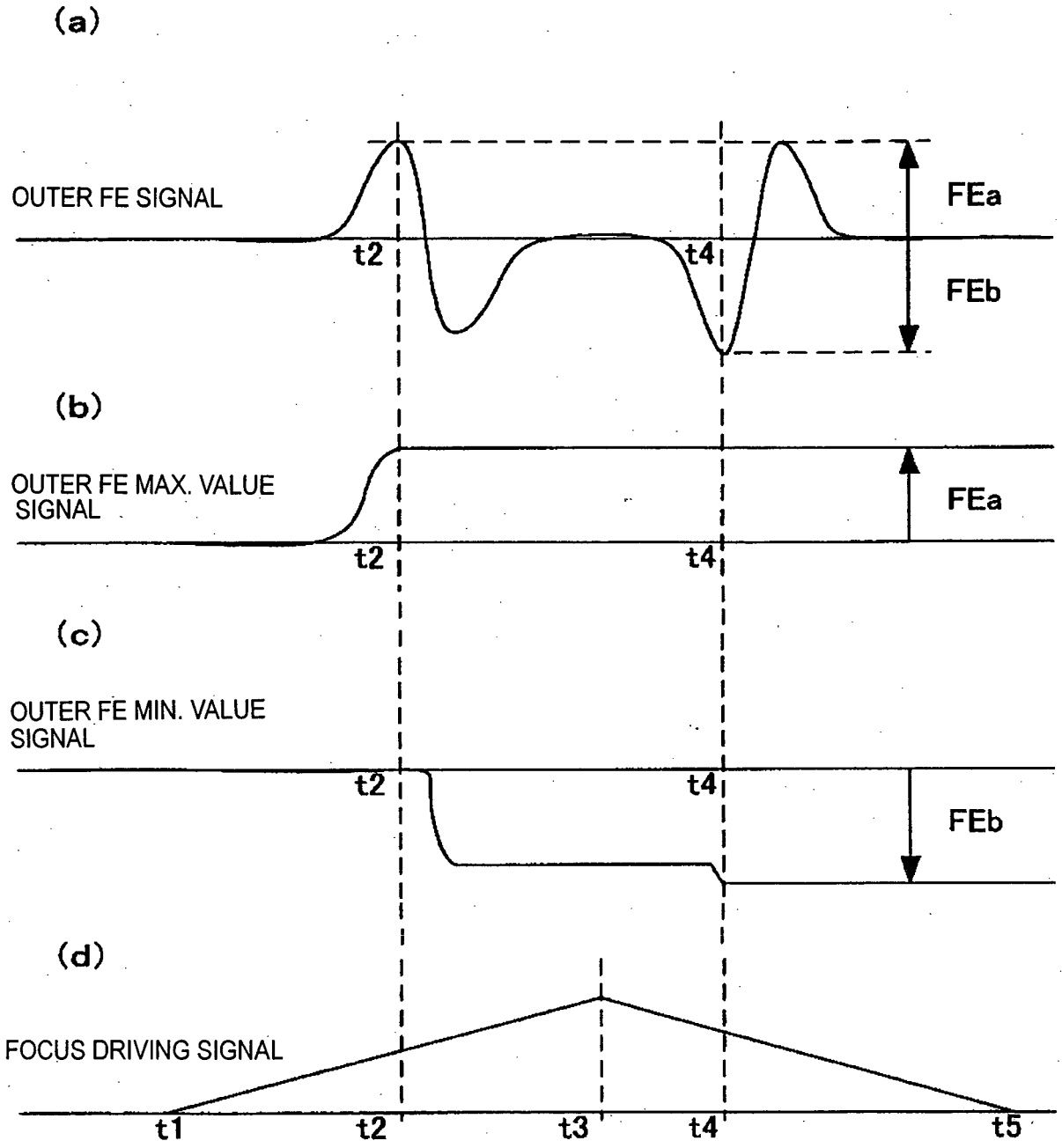

75. INNER FE AMPLITUDE MEASURER
83. INNER DIFFERENTIAL CALCULATOR
78
INNER FE MAX. VALUE MEASURER
45
INNER FE GEN.
79
INNER FE MIN. VALUE MEASURER
+
−
8
MICROCOMPUTER

FIG.10


(a)
OUTER FE SIGNAL
FEa
FEb
t2
t4
(b)
OUTER FE MAX. VALUE SIGNAL
FEa
t2
t4
(c)
OUTER FE MIN. VALUE SIGNAL
FEb
t2
t4
(d)
FOCUS DRIVING SIGNAL
t1
t2
t3
t4
t5

Title: Optical Disk Drive
Inventor: Yuichi KUZE et al.
Express Mail No.: EV 312205883 US Customer No.: 570
Atty. Docket No.: 10407-64US (A3037MT-US1)

FIG. 11

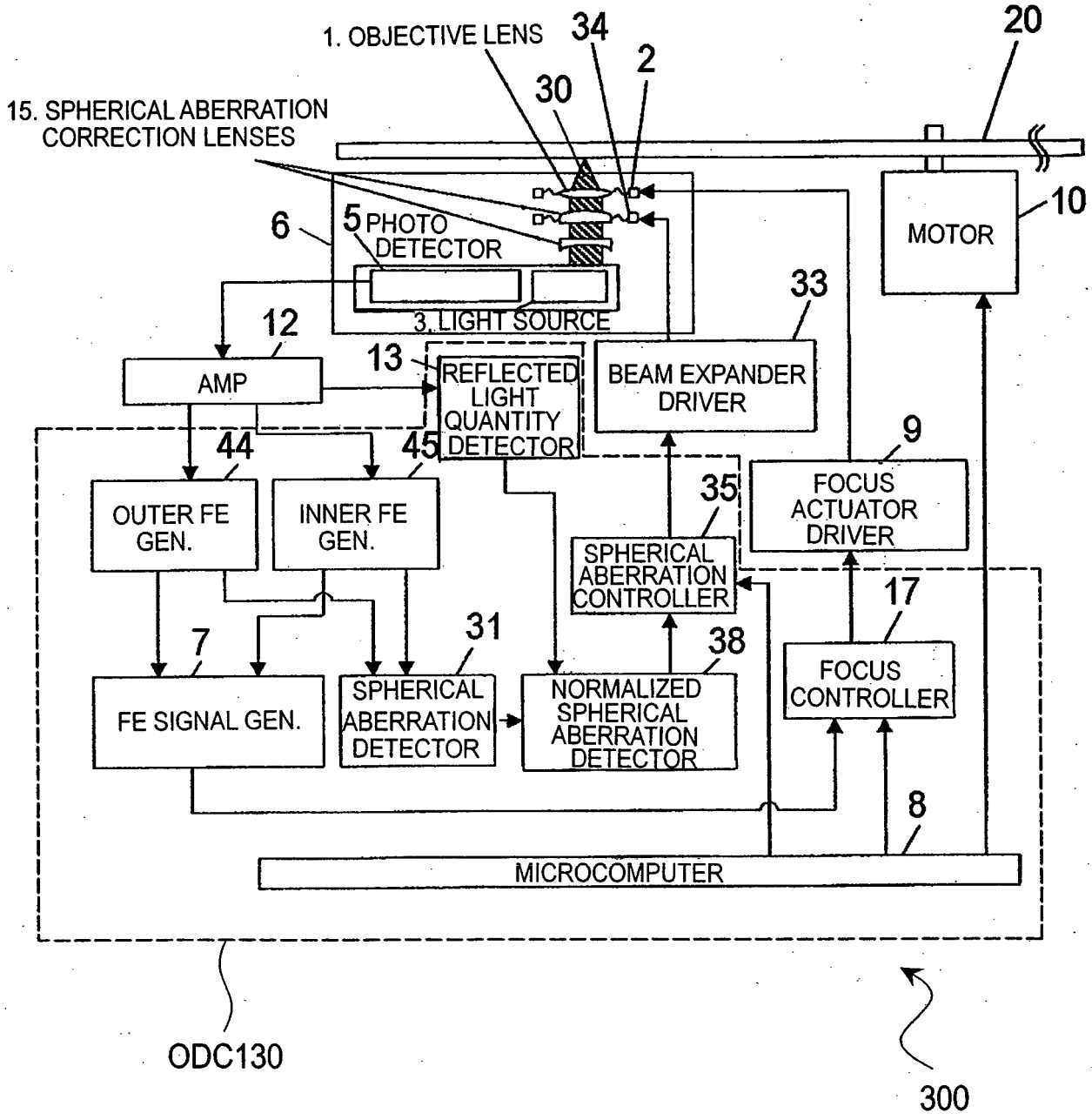


FIG. 12

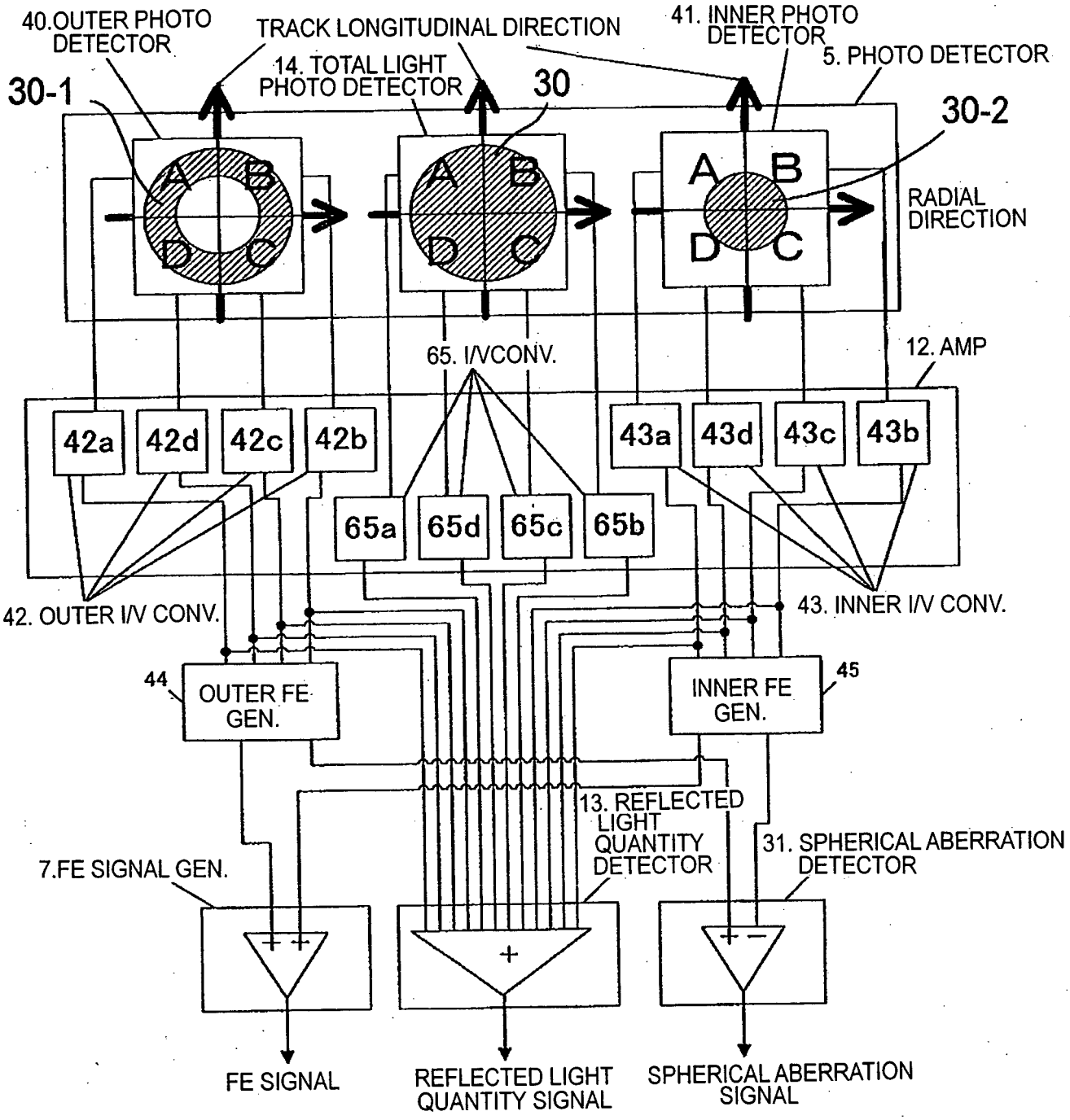

40.OUTER PHOTO DETECTOR
TRACK LONGITUDINAL DIRECTION
41. INNER PHOTO DETECTOR
5. PHOTO DETECTOR
14. TOTAL LIGHT PHOTO DETECTOR
30-1
30
30-2
A
B
C
D
RADIAL DIRECTION
65. I/VCONV.
12. AMP
42a
42d
42c
42b
43a
43d
43c
43b
65a
65d
65c
65b
42. OUTER I/V CONV.
43. INNER I/V CONV.
44
OUTER FE GEN.
INNER FE GEN.
45
13. REFLECTED LIGHT QUANTITY DETECTOR
31. SPHERICAL ABERRATION DETECTOR
7.FE SIGNAL GEN.
FE SIGNAL
REFLECTED LIGHT QUANTITY SIGNAL
SPHERICAL ABERRATION SIGNAL

FIG. 13A

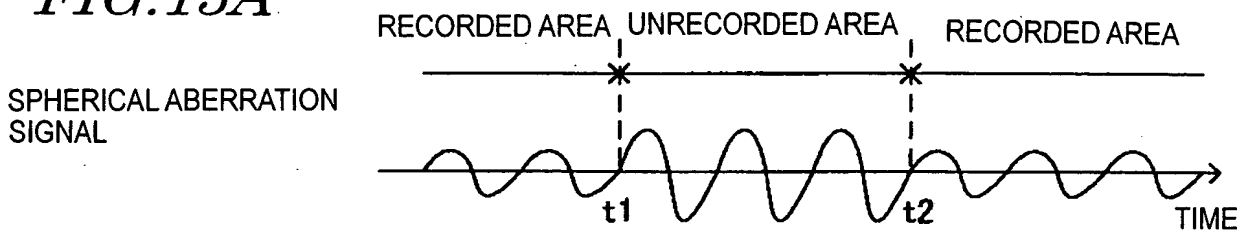


FIG. 13B

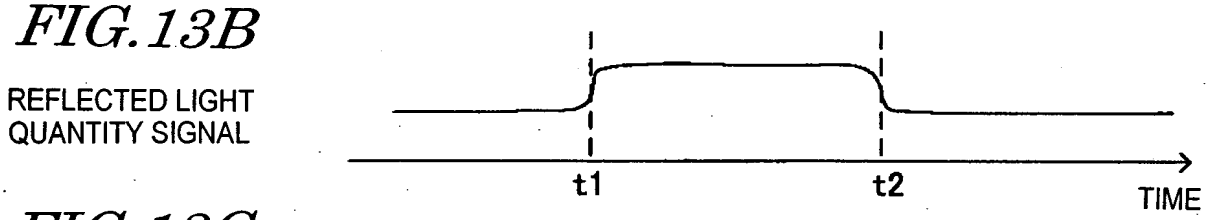


FIG. 13C

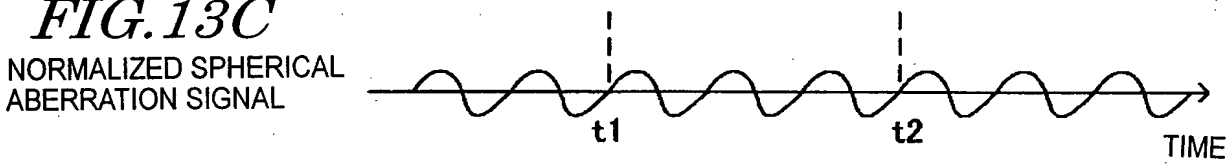


FIG.14

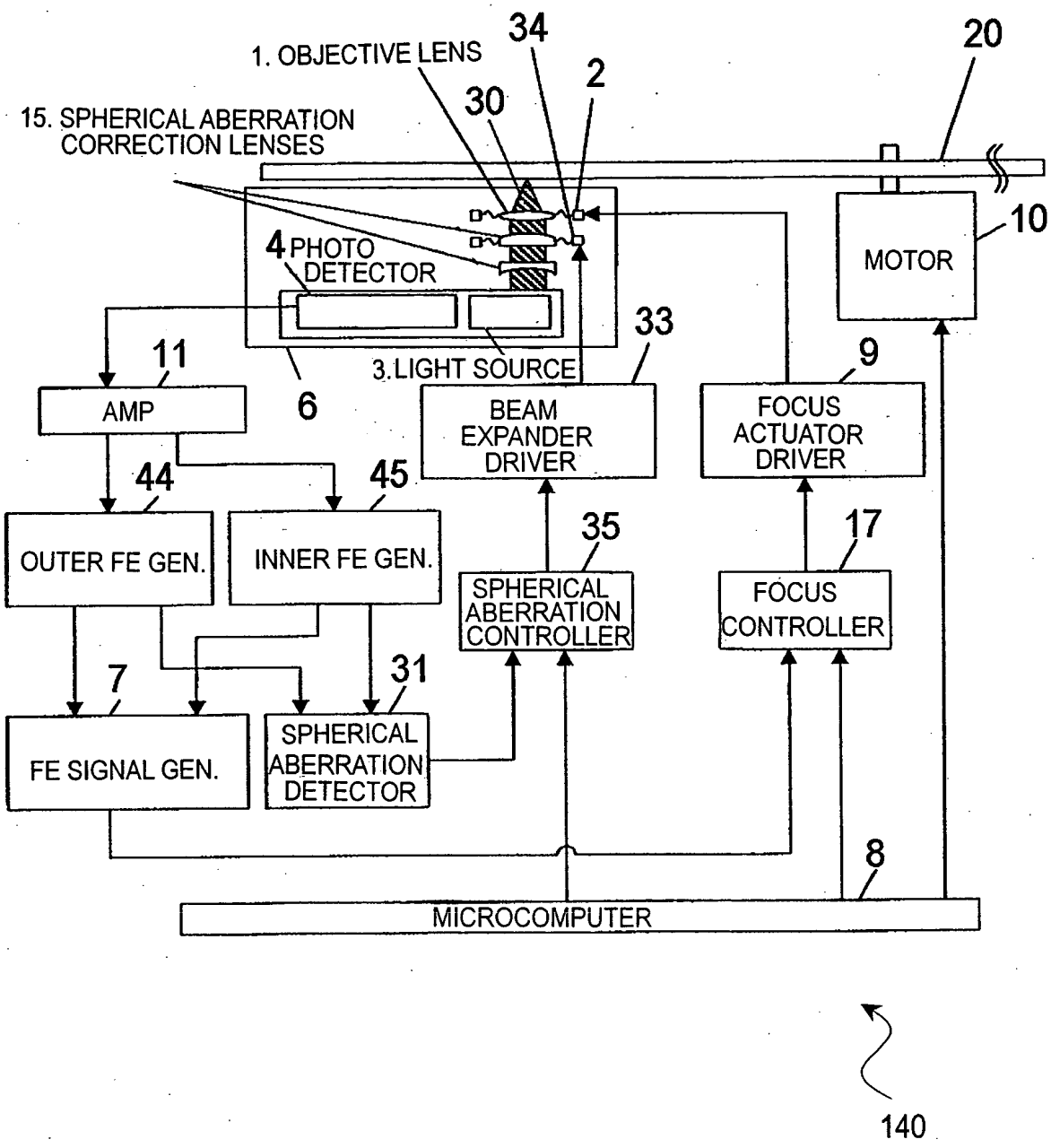

1. OBJECTIVE LENS
34
2
20
30
15. SPHERICAL ABERRATION CORRECTION LENSES
4 PHOTO DETECTOR
MOTOR
10
33
11
3. LIGHT SOURCE
9
AMP
6
BEAM EXPANDER DRIVER
FOCUS ACTUATOR DRIVER
44
45
35
17
OUTER FE GEN.
INNER FE GEN.
SPHERICAL ABERRATION CONTROLLER
FOCUS CONTROLLER
7
31
FE SIGNAL GEN.
SPHERICAL ABERRATION DETECTOR
8
MICROCOMPUTER
140

FIG. 15

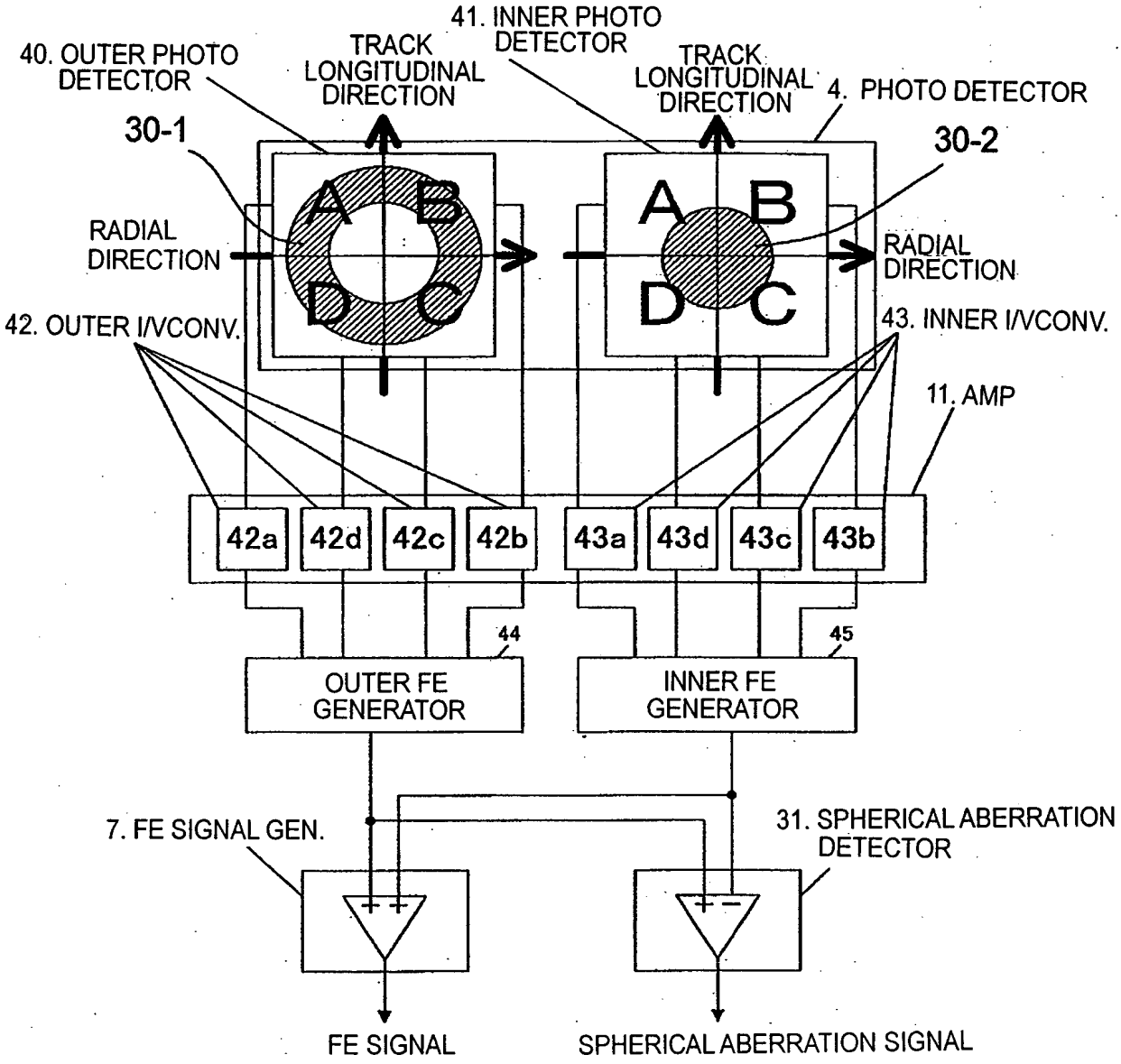

40. OUTER PHOTO DETECTOR
41. INNER PHOTO DETECTOR
TRACK LONGITUDINAL DIRECTION
TRACK LONGITUDINAL DIRECTION
4. PHOTO DETECTOR
30-1
30-2
A
B
D
C
A
B
D
C
RADIAL DIRECTION
RADIAL DIRECTION
42. OUTER I/VCONV.
43. INNER I/VCONV.
11. AMP
42a
42d
42c
42b
43a
43d
43c
43b
44
45
OUTER FE GENERATOR
INNER FE GENERATOR
7. FE SIGNAL GEN.
31. SPHERICAL ABERRATION DETECTOR
+ +
+ −
FE SIGNAL
SPHERICAL ABERRATION SIGNAL

FIG. 16A

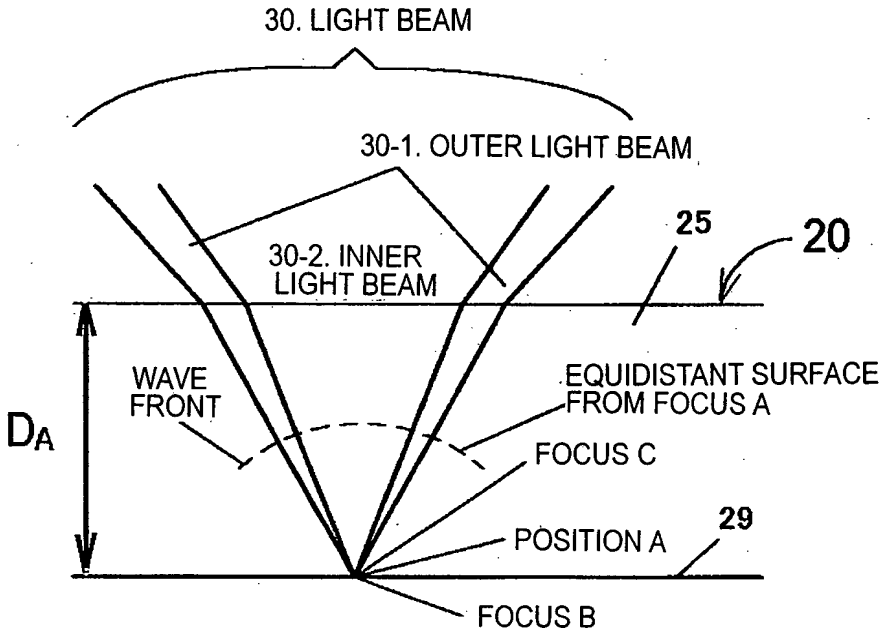


FIG. 16B

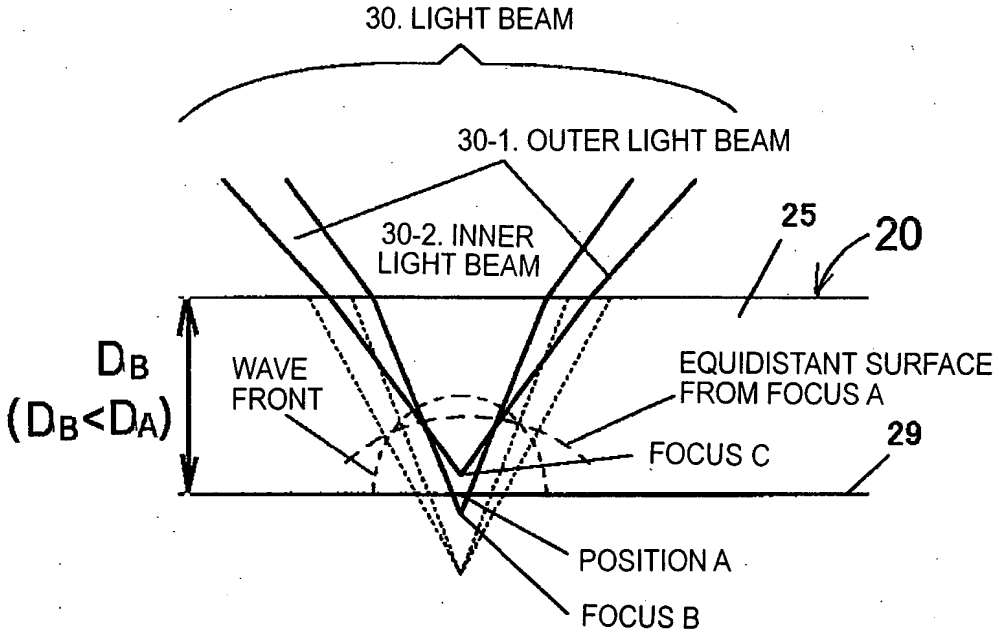


FIG.17A

DIVISION RATIO 50%

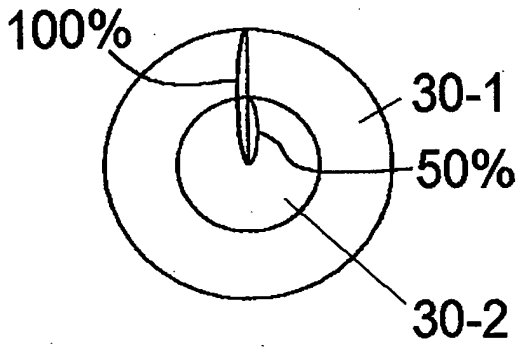


FIG.17B

OUTER FE SIGNAL

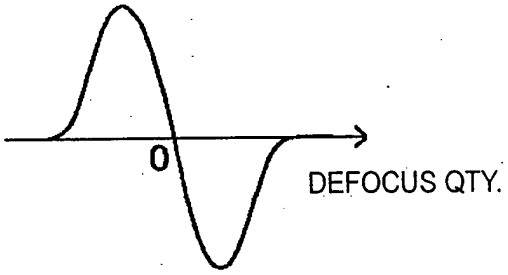


FIG.17C

INNER FE SIGNAL

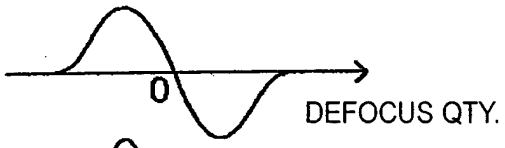


FIG.17D

FE SIGNAL

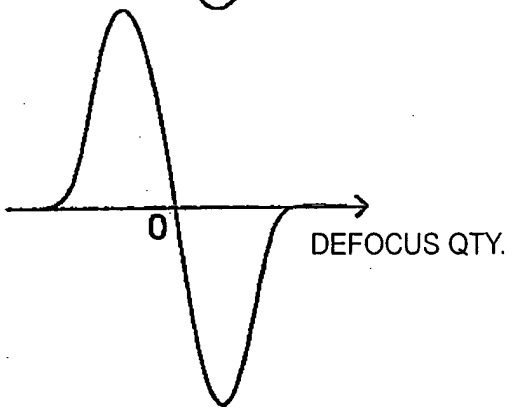


FIG.17E

SPHERICAL ABERRATION SIGNAL

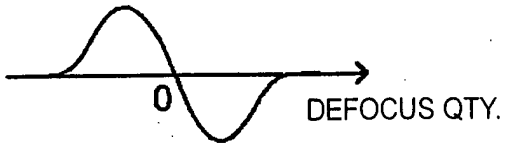


FIG.18A

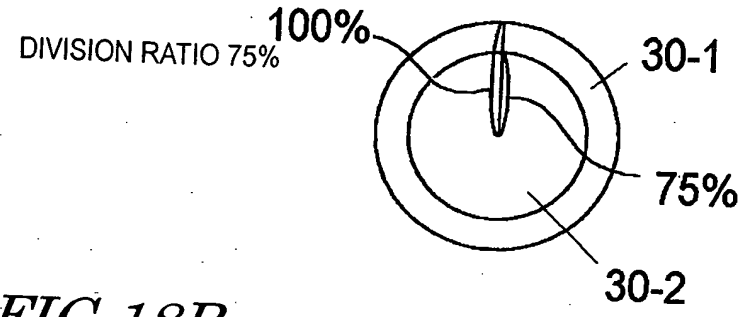


FIG.18B

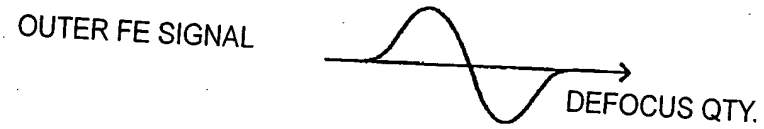


FIG.18C

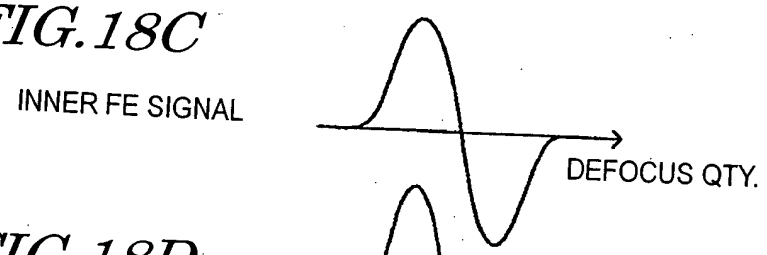


FIG.18D

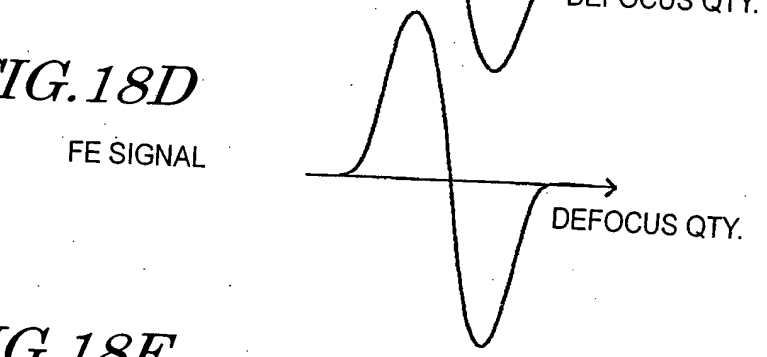
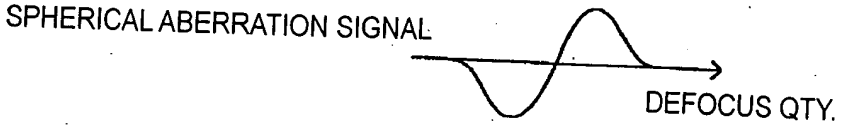



FIG.18E